TRANSMITTAL OF APPEAL BRIEF

Docket No.
1560-0401P

In re Application of: Koji KANDA

Application No.	Filing Date	Examiner	Group Art Unit
10/694,884-Conf.	October 29, 2003	R. D. McCloud	2837

Invention: VEHICLE STEERING APPARATUS

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith is the Appeal Brief in this application, with respect to the Notice of Appeal filed: May 11, 2006 .

The fee for filing this Appeal Brief is $ 500.00 .

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Dated: September 11, 2006

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Docket No.: 1560-0401P
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Koji KANDA

Application No.: 10/694,884 Confirmation No.: 004111

Filed: October 29, 2003 Art Unit: 2837

For: VEHICLE STEERING APPARATUS Examiner: R. D. McCloud

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
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Sir:

A Notice of Appeal was filed in the above case on May 11, 2006, together with a request for Pre-Appeal Brief Review. A Notice of Panel Decision from Pre-Appeal Brief Review was mailed on August 1, 2006. This brief is being filed within one month of the Notice of Panel Decision and is in furtherance of the May 11, 2006, Notice of Appeal.

The fees required under § 41.20(b)(2) are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1206:

I.	Real Party In Interest
II	Related Appeals and Interferences
III.	Status of Claims
IV.	Status of Amendments
V.	Summary of Claimed Subject Matter
VI.	Grounds of Rejection to be Reviewed on Appeal

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I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

Koyo Seiko Co., Ltd.

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 21 claims pending in application.

B. Current Status of Claims

1. Claims canceled: none
2. Claims withdrawn from consideration but not canceled: none
3. Claims pending: 1-21
4. Claims allowed: none
5. Claims rejected: 1-21

C. Claims On Appeal

The claims on appeal are claims 1-21.

IV. STATUS OF AMENDMENTS

Applicant did not file an Amendment After Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent Claims 1 and 11

With reference to Figure 1 and the paragraph spanning pages 7 and 8 of the specification, claim 1 recites a vehicle steering apparatus that uses a steering motor (5) to supply a steering mechanism (1) with steering force corresponding to a steering amount applied to a steering member (2). The apparatus includes a reaction force motor (3) for supplying the steering member (2) with steering reaction force (page 9, line 16 - page 10, line 11), a current sensor (8a) for detecting a motor current of the steering motor (5) and a controller (4). The controller extracts, using, e.g., filter 52 of Figure 2, a component with a predetermined frequency range out of the motor current detected by the current sensor (8a) (page 13, lines 1-10) and drives the reaction force motor (3) so as to supply the steering member (2) with steering reaction force corresponding to the extracted component and steering reaction force corresponding to the steering amount (page 13, lines 10-16).

Claims 3 and 13

Claim 3 recites that the controller (4) amplify, using, e.g., amplifier 54, the extracted component with a fixed amplification factor (page 15, lines 6-16). Claim 13 depends from claim 11 and includes limitations similar to those of claim 3.

Claims 4 and 14

Claim 4 recites that the vehicle steering apparatus also include a vehicle speed sensor (6) for detecting a vehicle running speed, and that the controller amplify the component with an amplification factor which increases and decreases on the basis of the vehicle running speed detected by the vehicle speed sensor (page 14, lines 8-15). Claim 14 depends from claim 11 and includes limitations similar to those of claim 4.

Claims 8 and 18

Claim 8 further recites that the predetermined range increase and decrease based on the detected vehicle speed (page 16, lines 3-9). Claim 18 depends from claim 11 and includes limitations similar to those of claim 8.

Claim 9

Claim 9 recites that the controller set a target value of steering reaction force which corresponds to a steering amount (page 11, lines 17-24, page 15, lines 7-8 and Figure 5), adds to said target value a target value of steering reaction force corresponding to the extracted component (page 15, lines 12-13), and wherein the controller drives the reaction force motor on the basis of a target value which has been obtained by addition (page 15, lines 13-16).

Independent Claim 11

With reference again to Figure 1 and the paragraph spanning pages 7 and 8 of the specification, claim 11 recites a vehicle steering apparatus which uses a steering motor (5) to supply a steering mechanism (1) with steering force corresponding to a steering amount applied to steering means (2). The apparatus includes a reaction force motor (3) for supplying the steering means (2) with steering reaction force (page 9, line 16 through page 10, line 11), current detecting means (8a) for detecting a motor current of the steering motor (5), extracting means (4, 52) for extracting a component within a predetermined frequency range out of the motor current detected by the current detecting means (8a), and reaction force motor driving means (4, 7) for driving the reaction force motor (3) so as to supply the steering means (2) with steering reaction force corresponding to the component extracted by the extracting means and steering reaction force corresponding to the steering amount.

Claim 19

Claim 19 further recites means for setting a target value of steering reaction force which corresponds to the steering amount (40 in Figure 2; page 15, 6-16) and adding means (56) for adding to said target value a target value of steering reaction force corresponding to the

component extracted by the extracting means (page 15, lines 12-13). Claim 19 further recites that the reaction force motor driving means (4, 7) drive the reaction force motor (3) on the basis of a target value which has been obtained by addition by the adding means (page 15, lines 14-16).

Independent Claim 21

Claim 21 recites, with reference to Figure 1 and the paragraph spanning pages 7 and 8 of the specification, a vehicle steering apparatus that includes a steering member (2), a steering mechanism (1), a steering motor (5) operatively connected to the steering member (2) and supplying a steering force to the steering mechanism (1) based on a position of the steering member (2), a reaction force motor (3) for applying a steering reaction force to the steering member (2), a current sensor (8a) for detecting a motor current of the steering motor (5), and a controller (4). The controller (4) is for extracting a predetermined frequency component from the motor current detected by the current sensor and adjusting the steering reaction force based on the extracted component (page 13, lines 1-16).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether the rejection of claims 1-21 under 35 U.S.C. 103(a) as being unpatentable over Discenzo, U.S. 6,097,286, in view of Kurishige, U.S. 6,161,068, should be reversed.

VII. ARGUMENT

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Discenzo in view of Kurishige. It is respectfully submitted that 1) a proper motivation for combining these references has not been identified and 2) even if the references could somehow be combined, the result would not be the invention recited by claim 1. Each of these issues is discussed below.

A. A Proper Motivation for Modifying Discenzo Has Not Been Provided

Steer-by-wire systems, such as the one disclosed in Discenzo, are discussed at column 1, lines 4-39 of Discenzo. In such systems, a steering wheel is not mechanically connected to the

steering linkages that turn the wheels of a vehicle. Instead, a servo motor 28 is connected to the steering linkages. An encoder 26 monitors the position of a steering column 24, and the output of this encoder is used to control the servo motor. However, in these systems, vibrations from the road surface cannot easily be felt by a driver because there is no mechanical connection between the wheels and steering wheel. Thus, while steer-by-wire systems have benefits, useful information about the road and the handling of the car may be lost. Discenzo addresses this problem by providing a torque detector 30, such as a photoelectric neural net sensor, that detects the torque placed on a gearbox 30 by the wheels moving over a road. Based on this detected torque, a motor 38 connected to the steering column is driven to make the steering wheel feel more like the steering wheels of traditional systems where there is a mechanical connection between the steering wheel and the road to provide "road-feel" information to the driver.

In traditional, power assist power steering systems, such as the system disclosed in Kurishige, a steering wheel is mechanically connected to the steering linkages. Thus, vibrations caused by the type or condition of a road surface will travel through these mechanical connections and be felt in the steering wheel by a driver. In order to make the steering wheel easier to turn, a motor is connected between the steering wheel and the steering linkages to help turn the vehicle wheels. In Kurishige, a torque sensor 1 detects the torque placed on a steering column by the driver turning a steering wheel and, after various types of signal processing, a current command is sent to current controller 7 which drives motor 8. Current detector 9 detects motor current and provides this information in a feedback loop to current controller 7 to adjust the motor current.

The invention defined by claim 1 is a steer-by-wire power steering system that provides road-feel to a driver. The inventors found that road feel can be provided without the need for a torque sensor like the one used by Discenzo. In the present invention, a current sensor senses the motor current of a steering motor and a controller extracts a frequency component of that current and uses the extracted component to control a reaction force motor which is connected to a steering wheel.

The examiner has argued that Discenzo does not teach a current sensor but that Kurishige teaches "torque is proportional to current." Kurishige, at column, 1, lines 44-54, indicates that a

power assist power steering motor may be driven by a current almost proportional to the torque created by the driver turning a steering wheel.

The examiner has argued that it would have been obvious to eliminate Discenzo's torque sensor and instead monitor the current of Discenzo's servo motor based on the teachings of Kurishige. The reason for doing this is stated to be "in order to provide an assist torque to the motor and to reduce discomfort to the driver." As discussed above, however, Discenzo is a steer-by-wire system that does not require the "assist torque" used in systems like the Kurishige system. The fact that Kurishige provides "assist torque" in no manner suggests monitoring motor current in Discenzo or somehow providing assist torque in Discenzo. The vehicle wheels in Discenzo are turned by detecting the position of a steering wheel; there is no torque mechanically transferred from the steering wheel to the steering linkages that requires assistance from a motor. Discenzo has no need of assist torque, and therefore providing assist torque is not a motivation for modifying Discenzo.

The other reason for modifying Discenzo is to "reduce discomfort to the driver." The word "discomfort" does not appear in Discenzo or Kurishige, and therefore it is not clear from where this motivation is derived. Discenzo does note at column 3, lines 15-17, that the jolt from a driver hitting a pothole can be removed from the forces transmitted to a steering wheel. However, the fact that Discenzo operates in this manner does not suggest that any further modification to Discenzo should be made based on Kurishige in order to "reduce discomfort to a driver." Finally, it is not clear how removing Discenzo's torque sensor would reduce discomfort to a driver.

Moreover, Discenzo teaches away from the modification suggested by the examiner by describing a separate torque sensor in addition to a servomotor for moving the vehicle wheels. By disclosing a torque sensor, specifically a photoelectric neural net torque sensor, Discenzo suggests that a torque sensor of some kind is necessary. Only the present disclosure teaches a system that can operate without such a torque sensor. One skilled in the art would have no reason to remove Discenzo's torque sensor and monitor motor current based on the references of record.

For the foregoing reasons, it is respectfully submitted that a motivation for modifying

Discenzo has not been provided. Instead, it appears that only the teachings of the present application suggest that modifications to Discenzo might be possible and that the present rejections are based on an improper use of hindsight. No motivation for modifying the references has been provided, and a *prima facie* case of obviousness has not been presented. All claims are rejected in part based on a combination of Discenzo and Kurishige. Because a reason for modifying Discenzo in view of Kurishige has not been provided, it is respectfully submitted that all claims, claims 1-21, are allowable over this combination of references. Reconsideration and allowance of these claims is therefore respectfully requested.

B. Even If the References Could Be Combined, the Result Would Not Be the Invention Recited in the Pending Claims

Even if a motivation for combining Discenzo and Kurishige were provided, the combination would in no manners suggest the invention recited by the pending claims. The examiner does not appear to rely on any particular aspect of Kurishige's disclosed system to support the present rejections. Instead, the examiner relies on this reference only to support the statement "torque and current are proportional" ("The examiner did not refer to the entire teachings of Kurishige. The examiner relied on Kurishige as a teaching reference to show that it is well known in the art that torque and current are proportional, as described in the background of the invention" (January 19, 2006, Office Action, Response to Arguments section)). Applicant acknowledges 1) some traditional power steering systems may produce a steering motor assist current approximately proportional to torque on a steering column and 2) increasing the current input to some motors, under some conditions, will increase the torque output by those motors. However, these facts in no manner suggest that the torque applied against a steering gear box by vehicle wheels is proportional to the current produced by the steering motor used to move those wheels. These facts in no manner suggest that useful information can be obtained from extracted frequencies of motor current based on forces input through a vehicle wheels, steering linkages and servomotor. These facts in no manner suggest that Discenzo's torque sensor is unnecessary. The pending claims are discussed below in light of these comments.

Claim 1

Claim 1 recites a vehicle steering apparatus which uses a steering motor to supply a steering mechanism with steering force corresponding to a steering amount applied to a steering member that includes a reaction force motor for supplying the steering member with steering reaction force, a current sensor for detecting a motor current of the steering motor and a controller. The controller extracts a component within a predetermined frequency range out of the motor current and drives the reaction force motor so as to supply the steering member with steering reaction force corresponding to the extracted component and steering reaction force corresponding to the steering amount. As acknowledged by the examiner, Discenzo does not show or suggest a current sensor as claimed. The fact that Kurishige describes a steering assist current approximately proportional to steering torque in no manner suggests replacing Discenzo's gear box torque sensor with a steering motor current sensor. Claim 1 is submitted to be allowable over Discenzo and Kurishige for at least this reason.

Claims 2-10 depend from claim 1 and are submitted to be allowable for at least the same reasons as claim 1. Further differences are discussed below in connection with certain ones of these dependent claims.

Claim 3

Claim 3 further recites that the controller amplify the extracted component with a fixed amplification factor. The examiner cites to column 6, lines 8-15 of Kurishige to support this rejection. These lines of Kurishige indicate that a damping current can be calculated based on motor rotation speed. This portion of Kurishige in no manner suggests amplifying an extracted frequency component of a motor current for use in controlling a reaction force motor. Claim 3 further distinguishes over the applied references for this reason.

Claim 4

Claim 4 further recites a vehicle speed sensor for detecting a vehicle running speed, wherein the controller amplifies an extracted frequency component with an amplification factor which increases and decreases on the basis of the vehicle running speed detected by the vehicle

speed sensor. The examiner refers to Figure 9a of Kurishige to support this rejection. This Figure illustrates a relationship between steering motor oscillation frequency and gain. This Figure in no manner suggest controlling the amplification of an extracted frequency component with an amplification factor which increases and decreases based on vehicle speed. Claim 4 further distinguishes over the applied references for this reason.

Claim 8

Claim 8 recites a vehicle speed sensor for detecting a vehicle running speed, and that the predetermined range increase and decrease on the basis of the vehicle running speed detected by the vehicle speed sensor. The examiner again refers to Figure 9a of Kurishige to show this limitation. It is respectfully submitted that a graph showing the relationship between applied gain and steering motor oscillation frequency in no manners suggests the invention recited in claim 8.

Independent Claim 11

Independent claim 11 recites, *inter alia*, current detecting means for detecting a motor current of a steering motor, extracting means for extracting a component within a predetermined frequency range and reaction force motor driving means for driving the reaction force motor. This means-plus-function language has not been addressed in the manner required by MPEP 2183 to support a *prima facie* case of obviousness. The MPEP provides that if "the examiner finds that a prior art element (A) performs the function specified in the claim, (B) is not excluded by any explicit definition provided in the specification for an equivalent, and (C) is an equivalent of the means- (or step-) plus-function limitation, the examiner should provide an explanation and rationale in the Office action as to why the prior art element is an equivalent (emphasis added). A *prima facie* case of obviousness has therefore not been presented in connection with claim 11. The arguments distinguishing claim 1 over Discenzo and Kurishige are also relevant to the rejection of claim 11, and claim 11 is submitted to further distinguish over Discenzo and Kurishige for the reasons provided above in connection with claim 1.

Claims 12-20 depend from claim 11 and are submitted to be allowable for at least the same reasons as claim 11.

Independent claim 21

Claim 21 recites a vehicle steering apparatus that includes a steering member, a steering mechanism, a steering motor operatively connected to the steering member and supplying a steering force to the steering mechanism based on a position of the steering member and a reaction force motor for applying a steering reaction force to the steering member. Claim 21 further recites a current sensor for detecting a motor current of the steering motor and a controller. The controller is for extracting a predetermined frequency component from the motor current detected by the current sensor and adjusting the steering reaction force based on the extracted component.

Discenzo does not include a current sensor as recited in claim 21. As discussed above in connection with claim 1, a motivation for modifying Discenzo in view of Kurishige has not been provided. Even if the teachings of Kurishige were used, they in no manners suggest providing Discenzo with a current sensor as recited in claim 21. For this reason, and the reasons provided above in connection with claim 1, claim 21 is submitted to patentably distinguish over the applied references.

C. Conclusion

For the foregoing reasons, the withdrawal of the rejections of claims 1-21 and the allowance of claims 1-21 is earnestly solicited.

Dated: September 11, 2006

Respectfully submitted,

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APPENDIX A

Claims involved in the appeal of Application Serial No. 10/694,884. These include the amendments filed by Applicant on November 14, 2005.

1. A vehicle steering apparatus which uses a steering motor to supply a steering mechanism with steering force corresponding to a steering amount applied to a steering member, comprising:

a reaction force motor for supplying the steering member with steering reaction force;

a current sensor for detecting a motor current of the steering motor; and

a controller for performing operations of:

extracting component within a predetermined frequency range out of the motor current detected by the current sensor; and

driving the reaction force motor so as to supply the steering member with steering reaction force corresponding to the extracted component and steering reaction force corresponding to the steering amount.

2. The vehicle steering apparatus according to Claim 1, wherein the controller further amplifies the extracted component.

3. The vehicle steering apparatus according to Claim 2, wherein the controller amplifies the component with a fixed amplification factor.

4. The vehicle steering apparatus according to Claim 2, further comprising a vehicle speed sensor for detecting a vehicle running speed, wherein the controller amplifies the component with an amplification factor which increases and decreases on the basis of the vehicle running speed detected by the vehicle speed sensor.

5. The vehicle steering apparatus according to Claim 2, wherein the predetermined range is a range between 3 Hz and 15 Hz.

6. The vehicle steering apparatus according to Claim 1, wherein the predetermined range is a range between 3 Hz and 15 Hz.

7. The vehicle steering apparatus according to Claim 1, wherein the predetermined range is fixed.

8. The vehicle steering apparatus according to Claim 1, further comprising a vehicle speed sensor for detecting a vehicle running speed, wherein the predetermined range increases and decreases on the basis of the vehicle running speed detected by the vehicle speed sensor.

9. The vehicle steering apparatus according to Claim 1, wherein the controller further performs operations of:

setting a target value of steering reaction force which corresponds to the steering amount;

adding to said target value a target value of steering reaction force corresponding to the extracted component,

wherein the controller drives the reaction force motor on the basis of a target value which has been obtained by addition.

10. The vehicle steering apparatus according to Claim 1, wherein the steering member and the steering mechanism are not connected mechanically with each other.

11. A vehicle steering apparatus which uses a steering motor to supply a steering mechanism with steering force corresponding to a steering amount applied to steering means, comprising:

a reaction force motor for supplying the steering means with steering reaction force;

current detecting means for detecting a motor current of the steering motor;

extracting means for extracting component within a predetermined frequency range out of the motor current detected by the current detecting means; and

reaction force motor driving means for driving the reaction force motor so as to supply the steering means with steering reaction force corresponding to the component extracted by the extracting means and steering reaction force corresponding to the steering amount.

12. The vehicle steering apparatus according to Claim 11, further comprising amplifying means for amplifying the component extracted by the extracting means.

13. The vehicle steering apparatus according to Claim 12, wherein the amplifying means amplifies the component with a fixed amplification factor.

14. The vehicle steering apparatus according to Claim 12, further comprising a vehicle speed sensor for detecting a vehicle running speed, wherein the amplifying means amplifies the component with an amplification factor which increases and decreases on the basis of the vehicle running speed detected by the vehicle speed sensor.

15. The vehicle steering apparatus according to Claim 12, wherein the predetermined range is a range between 3 Hz and 15 Hz.

16. The vehicle steering apparatus according to Claim 11, wherein the predetermined range is a range between 3 Hz and 15 Hz.

17. The vehicle steering apparatus according to Claim 11, wherein the predetermined range is fixed.

18. The vehicle steering apparatus according to Claim 11, further comprising a vehicle speed sensor for detecting a vehicle running speed, wherein the predetermined range increases and decreases on the basis of the vehicle running speed detected by the vehicle speed sensor.

19. The vehicle steering apparatus according to Claim 11, further comprising:

means for setting a target value of steering reaction force which corresponds to the steering amount;

adding means for adding to said target value a target value of steering reaction force corresponding to the component extracted by the extracting means,

wherein the reaction force motor driving means drives the reaction force motor on the basis of a target value which has been obtained by addition by the adding means.

20. The vehicle steering apparatus according to Claim 11, wherein the steering means and the steering mechanism are not connected mechanically with each other.

21. A vehicle steering apparatus comprising:

a steering member;

a steering mechanism;

a steering motor operatively connected to the steering member and supplying a steering force to the steering mechanism based on a position of the steering member;

a reaction force motor for applying a steering reaction force to the steering member;

a current sensor for detecting a motor current of the steering motor; and

a controller for extracting a predetermined frequency component from the motor current detected by the current sensor and adjusting the steering reaction force based on the extracted component.

APPENDIX B

No evidence is submitted.

APPENDIX C

There are no related proceedings.